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DATE 2-16-56
For The Atomic Energy Commission
T. B. Cornell
Chief, Declassification Branch

MONTHLY HEALTH REPORT ON PROBLEMS RELATING TO [illegible]

FOR PERIOD ENDING SEPTEMBER 31, 1944

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INDUSTRIAL HAZARDS SECTION
I. J. Nickson, Section Chief
J. [illegible] Rose, Associate Section Chief

MONTHLY REPORT FOR SEPTEMBER

Raw Chemistry Survey

Hand surveys: 344 alpha surveys were done in the New Chem laboratories. These were done for the most part in the filtered-air section. The number of rooms showing contaminated areas has not changed greatly during the past month. As has been noted before, certain rooms are found to be usually contaminated, other rooms are found to be clean.

Hand surveys: The technique used for alpha hand surveys was described in the previous month's report. Unfortunately the instrument broke down during the past month. Due to press of other work in the instrument section, repair could not be done immediately. In consequence, this service has been sharply curtailed during the past month.

Nose surveys: 81[illegible] nose counts for alpha contamination were done during the previous month. Three nose counts, or 0.4 % of the counts, were found to be greater than 50 counts per minute.

Face counts: 817 face counts were done during the previous month. Twenty-seven face counts, or 3.5 % were found to be greater than 50 counts per minute. It is interesting to note that one-half of the high face counts were obtained in a period of two days in one group of Mr. Seaborgs's section. Inquiry revealed that the most likely source of contamination was the operation of an unvented centrifuge during these two days.

The question of the control of air which is passed through the centrifuge in which product is being processed has come up on several occasions. As a result of several discussions, a program for exhausting the air from the centrifuges to an adjacent hood has been proposed. The necessary equipment is

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now being installed on the centrifuges. On several occasions survey of centrifuges being used for product work has shown that high level of contamination of the bowl may be present. Analysis of the exhaust air for such centrifuges have frequently shown considerable amounts of product.

Site B Annex

The conversion of a work area in this building for product work has not been completed. In consequence, product work in this site has been kept to a minimum.

West Stands

Solvent extraction process: several discussions have been held in the general technical section of the technical division concerning measures for health protection to be used during the operation of this process in this building. As a result of these discussions several recommendations have been made which will be installed before operation with active material begins.

Product Determination in Urine

During the month ending 9-23-44, 105 analyses were done on specimens obtained from 78 individuals. Only two individuals showed alpha activity extracted from the urine which was greater than twice background. This activity is approximately 1 x 10^{-11} grams product per 100 c.c. urine.

During the month rather high readings, relatively speaking, were obtained on several individuals. These values were found on individuals whose exposure to product was not markedly different from the individuals [illegible] whose counts were not elevated. Investigation revealed that one of the reagents had become contaminated with alpha activities. The error emphasizes the necessity of having a laboratory area absolutely free from product. This, in many instances, means that it is desirable to do such work in laboratories in which product has not been handled before.

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Present procedure for the determination of Product in Urine (it is emphasized that this procedure outlines present practice. The technique, however, has changed from time to time in the past and undoubtedly will change in the future)

1)- One hundred ml sample of urine is treated with 10 ml of 6 normal HCl and diluted to 150 ml.

2) The resulting solution is passed through a 3 gram IR-1 absorption column. The column is washed with 150 ml of 0.6 normal HCl.

3) The absorption column is then washed with 100 ml of 6 normal HCl. The first 5 ml and the last 45 ml of this acid solution are discarded.

4) The intermediate 50 ml of solution is evaporated to near dryness. The organic material is destroyed with nitric acid and superoxol.

5) The remaining solution (Approximately 1 ml) is transferred to a platinum disk of known alpha background and counted at least four times. Each count is of 4 minutes duration.

There may be some doubt as to complete recovery in every case as some variation in the different urine specimens may cause some changes in the absorption. A few tests have been made showing that over 90 % recovery is obtained when a known amount of product was present in a 1 % sodium chloride and 2 % urea solution.

Spiked urine tests have shown that recovery in most instances is around 95 % and in all instances above 90 %. These represent, however, only scattered tests and by no means represent a refined proceedure. The conditions for extraction at present have a 20 % safety factor which should insure almost complete recovery.

Metallurgical Laboratory

BIOLOGICAL RESEARCH SECTION

K. S. Cole, Section Chief

A. Inhalation of + 4 Product.

No new exposures have been made. The last animals in the first exposure of rats to $PxCl_4$ were sacrificed and the experiment is summarized. Roughly 30 percent of the activity originally deposited in the lungs found its way to the skeleton in approximately 30 days. The rate of loss of activity from the lung decreased with time so that at from 50 to 75 days the lung activity remained roughly constant at about 10 percent of its initial value.

A similar experiment with mice gave a half time for $PxCl_4$ in the lung of 25 days.

B. Injection of + 6 Product - rat.

The use of lanthanum fluoride in removing product from extracts of tissue ashes has been tested. Correction factors for the mass absorption in samples of urine, feces, and gone were determined to be 1.35, 1.45, and 1.20, respectively. Five rats injected with + 6 product, intracardially, were sacrificed after four days. Fourteen tissues, urine and feces were separated, ashed and analysed. The overall recovery of product was 94 percent $\pm$ 5 percent. When product solutions are added to clear tissue extracts and brought down with lanthanum fluoride using the same semi-micro apparatus and techniques the recovery is 97 percent $\pm$ 3 percent.

13 percent of the injected product was excreted in 4 days, 7 percent with feces, 6 percent in the urine. The skeleton retains over 60 percent and the liver about 12 percent. Fairly large variations in retention are not uncommon and the use of single animals forsampling an experimental colony should be avoided.

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U of C RADIATION LABORATORY

J. G. Hamilton and Associates

II. TECHNICAL PROGRESS REPORT ON THE METABOLIC STUDIES OF PRODUCT

1. Radio-Autographic Studies

Lung Radio-Autographs from animals inhaling PuO_2 smoke produced by the volatilization of $PuCl_4$ and $Pu(NO_3)_4$ with the aid of an electric arc have been completed for various intervals ranging from 0 to 16 days. Distribution immediately after inhalation of the PuO_2 smoke revealed considerable deposition in both the bronchial tree and alveolar air sacs. Radio-Autographs taken 96 hours after exposure showed almost complete removal of product from the bronchial tree. No significant alteration in the very uniformly diffuse patterns of distribution in the alveolar tissue was noted in lungs from animals sacrificed at the various time intervals between 0 and 16 days after exposure. The interpretation of the results described above is that initially relatively uniform distribution of the PuO_2 smoke took place throughout the entire extent of air passages of the lungs. The PuO_2 deposited in the bronchial passageways was rapidly removed by ciliary action but very little, if any, movement of the material in the alveolar tissue took place within the 16 day interval. Lung Radio-Autographs from animals sacrificed 64 days after exposure are now in preparation.

A large number of lung Radio-Autographs from animals exposed to PuO_2 smoke produced by burning the metal in an electric arc are being prepared. A few have been completed for the shorter time intervals following exposure and they appear to resemble quite closely the lung radio-autographs from animals exposed to PuO_2 smokes produced from $PuCl_4$ and $Pu(NO_3)_4$.

Bone Radio-Autographs are being prepared since the sliding microtome was recently received.

2. Tracer Studies

The tracer studies with PuO_2 smokes produced from $PuCl_4$ have now been extended to 64 days and it appears from data not yet fully completed that the PuO_2 held in the alveolar tissue was slowly removed by bronchial excretion. Apparently over 80% of the material originally deposited in the alveolar tissue was eliminated from the lungs during this interval. The PuO_2 initially in the bronchial tree was, as has been shown by lung Radio-autographs, very rapidly removed. Several additional long term studies with PuO_2 smokes are now in progress and the accumulations of more data will fix more precisely the actual quantitative rates of release of PuO_2 deposited in the lung following its inhalation. Less than 1% of the estimated amount initially inhaled was found to have been deposited in other tissues of the body; e.g. skeleton, liver, kidney, etc.

A total of 30 animals have been exposed already to PuO_2 smoke produced by burning Pu metal in a carbon arc. The metal, in the form of small pellets, was imbedded in the center of carbon rods approximately 1 mm. in diameter. The preparation of the metal and the loading of the carbon rods was done through the cooperation of Dr. Seaborg and his group. Preliminary

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assays of the tissues of animals sacrificed at o, 1, and 4 days after exposure to the PuO_2 smoke from the metal indicated that the behavior of product smoke from this type of source was very similar to the results observed smoke produced from $PuCl_4$ and $Pu(NO_3)_4$, which were reported last month.

3. Decontaminator Studies

The animals injected last month with product have now approached a sufficiently stable level of excretion to permit the initiation of different experimental regimes aimed at increasing the rates of elimination.

4. Projected Studies for the Next Two Months

The Radio-Autographic, tracer, smoke, and decontamination experiments are to be continued.

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